MAR10-2009-020002

Abstract for an Invited Paper
for the MAR10 Meeting of
the American Physical Society

FLASH, the Free-Electron Laser at DESY: Machine Performance and Recent Highlights from User Experiments[1]

WILFRIED WURTH, Department Physics and Centre for Free-Electron Laser Science, University of Hamburg

FLASH, the Free-Electron Laser at DESY in Hamburg is a world-wide unique facility delivering intense ultra-short coherent radiation pulses in the wavelength range between 47 and 6.8 nm. FLASH is a high-gain free-electron laser based on a superconducting linear accelerator currently running at 1GeV. Laser amplification and saturation in the so-called SASE (self-amplified spontaneous emission) mode is achieved with a single pass of the electron bunch through a 30m undulator. A machine upgrade which has been started recently will boost the energy to 1.2 GeV expanding the wavelength range to below 5nm. After the upgrade FLASH will also include the seeding experiment sFLASH where an external laser will overlap with the electron beam to seed the SASE process. First beam with the upgraded facility is expected in spring 2010. Since 2005 FLASH has been operating as a user facility serving a large variety of experiments. The unprecedented brilliance of the femtosecond coherent pulses in the extreme ultraviolet (XUV) and soft x-ray regime has been used to study nonlinear process in laser-matter interaction for atoms and molecules, to gain new insights in the properties of matter under extreme conditions and to perform single shot lens-less imaging of nano-sized objects. Furthermore, the pulse duration of less than 30 femtoseconds has allowed to gain new insights in ultrafast dynamics of matter. In the talk I will review machine performance and give examples of highlight experiments.

[1]supported by the German Federal Ministry of Education and Research through priority program FSP 301 FLASH